UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,682	03/31/2004	Wen Lin	LIN 13-38	8308

47396 7590 05/02/2008

HITT GAINES, PC
LSI Corporation
PO BOX 832570
RICHARDSON, TX 75083

EXAMINER	
MALDONADO, JULIO J	
ART UNIT	PAPER NUMBER
2823	

NOTIFICATION DATE	DELIVERY MODE
05/02/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@hittgaines.com

Office Action Summary	Application No.	Applicant(s)	
	10/814,682	LIN ET AL.	
	Examiner	Art Unit	
	JULIO J. MALDONADO	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *41-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 41-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bevk et al., (U.S. 5,500,391, hereinafter Bevk) in view of Liaw et al. (U.S. 5,891,769, hereinafter Liaw).

In reference to claim 41, Bevk (Fig.6) teaches a CMOS device including a germanium buried layer (20) located over a doped substrate (10), wherein a middle portion of said buried layer (20) is labeled co-doped germanium buried layer; and a doped epitaxial layer (30) located over said co-doped germanium buried layer (20) (Bevk, column 2, line 45 – column 4, line 19).

Bevk fails to expressly disclose a gate structure, wherein said gate structure including a gate dielectric gate electrode, and source and drain regions. However, this is inherent in Bevk since Bevk is directed to the formation of a CMOS structure. Accordingly Bevk teaches upon the recited limitation.

Still Bevk fails to disclose wherein said source/drain regions do not extend into said co-doped germanium buried layer.

However, Liaw (Figs.1 and 4) teaches a field effect transistor device including a substrate (Fig.1, '11' and Fig.4, '51'); a buried layer (Fig.1, '12' and Fig.4, '53') on said

substrate (Fig.1, '11' and Fig.4, '51'); an epitaxial layer (Fig.1, '19' and Fig.4, '54') on said buried layer (Fig.1, '12' and Fig.4, '53'); a gate structure (Fig.1, '22', Fig.4, '58') and source/drain regions (Fig.1, '16', '17', Fig.4, '56', '57'), wherein in one embodiment of the invention (Fig.1) the source/drain regions extends into said buried layer, wherein in a second embodiment of the invention (Fig.4) the source/drain regions does not extend into the buried layer, and wherein said buried layer (Fig.1, '12' and Fig.4, '53') is a co-doped germanium layer, SiC, AlN, or the like (Liaw, column 2, lines 36 – 56, column 3, lines 14 – 26, column 5, lines 36 – 50 and column 6, lines 17 – 39).

Furthermore, one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired CMOS device with desired source/drain regions. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Therefore, it would have been within the scope of one of ordinary skill in the art to combine the teachings of Bevk and Liaw to enable the disclosed source/drain regions of the CMOS of Bevk according to the teachings of Liaw because one of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful source/drain regions in Bevk and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

In reference to claim 42, the combined teachings of Bevk and Liaw teach wherein said co-doped germanium buried layer includes a p-type dopant (Bevk, column 4, lines 5 – 19).

In reference to claim 43, the combined teachings of Bevk and Liaw teach wherein said p-type dopant is boron (Bevk, column 4, lines 5 – 19).

In reference to claim 44, the combined teachings of Bevk and Liaw teach wherein said co-doped germanium buried layer should have a mole fraction of at least 0.1 and wherein the germanium concentration determines a level of strain and critical thickness (Bevk, column 2, lines 50 – 64), but fails to disclose wherein said co-doped germanium buried layer has a germanium concentration ranging from abut $1x10^{20}$ atoms/cm^3 to about $7x10^{20}$atoms/cm^3.

However, the selection of the claimed germanium concentration is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired germanium co-doped layer with a desired strain and thickness. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious)

and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to enable using the combination of Bevk and Liaw to arrive at the claimed limitation using routinary experimentation.

In reference to claim 45, the combined teachings of Bevk and Liaw substantially teach all aspects of the invention but fails to disclose wherein said co-doped germanium buried layer has a thickness ranging from about 1 μm to about 10 μm.

One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired buried layer. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

In reference to claim 46, the combined teachings of Bevk and Liaw substantially teach all aspects of the invention but fail to expressly disclose wherein said doped

substrate, said co-doped germanium buried layer, and said epitaxial layer collectively have a thickness ranging from about 2 μm to about 20 μm.

One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired substrate. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

In reference to claims 47 and 50 the combined teachings of Bevk and Liaw teach wherein the germanium layer has a graded germanium concentration, wherein said gradation is, for example, triangular grading or parabolic distribution (Bevk, column 2, line 65 – column 3, line 4), and wherein the dopant concentration of the dopant within said germanium layer is greater than in said substrate and said epitaxial layer (Bevk, column 4, lines 6 – 20), wherein a first portion of the germanium layer immediately next to the substrate is labeled first doped lattice matching layer, wherein a second portion immediately next to the doped epitaxial layer is labeled second doped lattice matching

layer, wherein a third portion next to said first portion is labeled third doped lattice portion, and wherein a fourth portion next to said second portion is labeled fourth doped lattice matching layer. Therefore, the combined teachings of Bevk and Liaw teach upon the claimed invention.

In reference to claim 48, the combined teachings of Bevk and Liaw teach wherein dopant concentrations of said first and second doped lattice matching layers are each less than a dopant concentration of said co-doped germanium buried layer (Bevk, Fig.6).

In reference to claim 49, the combined teachings of Bevk and Liaw teach wherein a dopant concentration of said doped substrate is less than said dopant concentration of said first doped lattice matching layer and a dopant concentration of said doped epitaxial layer is less than said dopant concentration of said second doped lattice matching layer (Bevk, Fig. 6).

In reference to claim 51, the combined teachings of Bevk and Liaw teach wherein a dopant concentration of said third doped lattice matching layer is more than said dopant concentration of said first doped lattive matching layer and a dopant concentration of said fourth doped lattice matching layer is more than said dopant concentration of said second doped lattice matching layer (Bevk, Fig.6).

In reference to claim 52, the combined teachings of Bevk and Liaw teach wherein said first and second doped lattice batching layers each include a dopant gradient wherein a dopant concentration of each of said dopant gradients is greater adjacent said co-doped germanium buried layer (Bevk, Fig.6).

3. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bevk ('391) in view of Liaw ('769) as applied to claims 40-52 above, and further in view of Ramadani et al. (U.S. 7,067,856 B2, hereinafter Ramadani).

The combined teachings of Bevk and Liaw substantially teach all aspects of the invention but fail to expressly disclose wherein said transistor structure further includes interconnects located within interlevel dielectric layers located over transistors, which connect the transistors to form an operational integrated circuit and additional active and passive devices.

However, it is well-known in the art directed to MOS devices that these devices further include interconnects and other active and passive devices located within interlevel dielectric layers located over the transistors, which connect the transistors to form an operational integrated circuit. Further support can be in Ramdani (Figs.7-11 and column 13, line 38 – column 16, line 21). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the device of the combination of Bevk and Liaw would also include the claimed limitations as is well-known or as supported by the teachings of Ramdani.

Response to Arguments

4. Applicant's arguments filed 03/18/2008 have been fully considered but they are not persuasive.

In response to the applicants' arguments, the prior art of record is directed to buried layers other than silicon carbide. Liaw in column 5, lines 36 – 51 discloses,

"...The method according to the present invention is also suitable for forming low defect heteroepitaxial films having a large lattice mismatch (greater than about 3%) compared to the substrate the heteroepitaxial films are grown on. For example, the method according to the present invention is suitable for growing low defect heteroepitaxial films of SiC, GaAs, AlN, GaN, AlGaAs, AlGaN or the like on substrates such as silicon. Such a method is desirable because it allows, among other things, the growth of high performance materials having desired properties on larger diameter substrates. This results in substrates having diameters more compatible with existing and future processing equipment. *By way of example only, the present invention will be described using the growth of SiC on a silicon substrate. As stated above, the present invention is equally suitable for growing other heteroepitaxial films*..." (Emphasis added).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JULIO J. MALDONADO whose telephone number is (571)272-1864. The examiner can normally be reached on Mon-Fri, 8:00 A.M.-4:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571)-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/George Fourson/
Primary Examiner, Art Unit 2823

/J. J. M./
Examiner, Art Unit 2823